



Contents lists available at ScienceDirect

LWT - Food Science and Technology

journal homepage: www.elsevier.com/locate/lwt

Growth adaptation of probiotics in biopolymer-based coacervate structures to enhance cell viability

L.A. Bosnea^a, T. Moschakis^a, P.S. Nigam^b, C.G. Biliaderis^{a,*}^a Department of Food Science and Technology, School of Agriculture, Aristotle University of Thessaloniki, GR-541 24 Thessaloniki, Greece^b School of Biomedical Sciences, University of Ulster, Cromore Rd., Coleraine BT62 1SA, Northern Ireland, United Kingdom

ARTICLE INFO

Article history:

Received 6 July 2016

Received in revised form

17 October 2016

Accepted 20 November 2016

Available online 21 November 2016

Keywords:

Post culture

Complex coacervates

Alginate microspheres

Dual encapsulation

ABSTRACT

The effect of inoculum size and growth of probiotic cells inside biopolymer-based coacervate structures, made from whey protein isolate and gum arabic, and a dual encapsulation method of complex coacervation coupled with ionotropic gelation on the survival of probiotics was evaluated under adverse environmental conditions; i.e. low pH, heating, and simulated gastric juice (SGJ). The encapsulated bacteria metabolized nutrients and multiplied within the coacervate structural assemblies, pointing to a rather open carrier-delivery system for microbial cells, allowing the exchange of metabolites and nutrients with the bulk liquid medium. Encapsulation of probiotic cells at low counts and subsequent growth improved cell viability upon heating or exposure to SGJ. When cells entrapped in complex coacervates were subsequently embedded in Ca²⁺-alginate gel microspheres, the remaining viable counts at pH 2.0 for 3 h were even higher by almost 1 logCFU/g. Overall, an initial low inoculum size of bacteria in complex coacervates, followed by culture growth (adaptation stage) and subsequent entrapment in alginate microspheres greatly enhanced the cell viability of probiotic cultures.

© 2016 Elsevier Ltd. All rights reserved.